PATENT SPECIFICATION

620,384

Application Date: Jan. 17, 1947. No. 1579/47.

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Index at acceptance:—**Classes 39(iii)**, H1j(1: 2), H2e6; **and 64(i)**, N8.

PROVISIONAL SPECIFICATION

Improvements in Thermostatically Controlled Electric Water Heaters

I, Oswald Adrian McDowell, of Marsh Farm, Dundalk, Eire, British Subject, do hereby declare the nature of this invention to be as follows:—

This invention is an improvement in or modification of the thermostatically controlled electric water heater described in the specification of my previous patent application No. 25953/45 (Serial No. 601,843).

The specification of my said prior patent application describes an electric water heater comprising an assemblage consisting of a thermostat within an enclosing riser pipe, enclosed in a downcast pipe, surrounded and heat-conductively connected to electric resistance heater elements located at at least two levels, all depending within and jointly removable from a water tank provided with an outlet from an upper level.

The said prior specification also describes a switching arrangement wherein a crosshead, secured to the projecting top of a nickel iron rod extending upwards within and from its anchorage to the bottom of a brass sleeve of the thermostat, carries adjustable tappets which, on expansion of the thermostat, successively bear against and open the switches of the electric resistance heater elements.

The objects of the present invention are to improve the conduction of heat from the heater elements to the thermostat, and also to provide a simple arrangement whereby the switch-actuation by the thermostat crosshead can be easily adjusted and also used manually to operate the switches

According to the present invention, the first object thereof is attained by substituting for the riser pipe, a corrugated sheet metal, for instance copper, tubular spacer in contact both with the outer surface of the brass sleeve of the thermostat and also with the inner surface of the downcast pipe. This corrugated spacer, whilst providing direct metallic heat-conductivity between the downcast pipe and the thermostat, by its corrugated profile overlapping the cold water inlet at the bottom also provides a number of channels up which the cold water will flow to sweep the thermostat sleeve. This corrugated spacer need extend only partway up the downcast pipe.

The second object of the invention is attained, by providing above the crosshead, a screw, screwing in an inverted **U**-bracket, extending upwards from the end of the thermostat sleeve and straddling the crosshead, which screw adjustably bears upon the midlength of a bar which is above the switch tappet crosshead and bears against its ends. The screw can thus be adjusted variably to distort, by minutely bending, the crosshead and thereby adjust its tappets relatively to the switches which they operate. By being screwed down hard, the screw can bend the crosshead sufficiently to open both switches manually.

Dated this 11th day of January, 1947.

PHILLIPS & LEIGH,
Agents for the Applicant.

COMPLETE SPECIFICATION

Improvements in Thermostatically Controlled Electric Water Heaters

I, Oswald Adrian McDowell, of Marsh Farm, Dundalk, Eire, British Subject, do hereby declare the nature of this invention and in what manner the

same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention is an improvement in or modification of the thermostatically controlled electric water heater described in the specification of my previous patent application No. 25953/45 (Serial No. 601,843).

The specification of my said prior patent application describes an electric water heater comprising an assemblage consisting of a thermostat within an enclosing riser pipe, enclosed in a downcast pipe, surrounded and heat-conductively connected to electric resistance heater elements located at at least two levels, all depending within and jointly removable from a water tank provided with an outlet from an upper level.

The said prior specification also describes a switching arrangement wherein a crosshead, secured to the projecting top of a nickel iron rod extending upwards within and from its anchorage to the bottom of a brass sleeve of the thermostat, carries adjustable tappets which, on expansion of the thermostat, successively bear against and open the switches of the electric resistance heater elements.

The objects of the present invention are to improve the conduction of heat from the heater elements to the thermostat, and also to provide a simple arrangement whereby the switch-actuation by the thermostat crosshead can be easily adjusted and also used manually to operate the switches.

According to the present invention, the first object thereof is attained by substituting for the riser pipe, a tubular corrugated metal, for instance copper, spacer in metallic heat-conducting continuity both with the outer surface of the brass sleeve of the thermostat and also with the inner surface of the downcast pipe. This corrugated spacer, whilst providing direct metallic heat-conductivity between the downcast pipe and the thermostat, by its corrugated profile overlapping the cold water inlet at the bottom also provides a number of channels up which the cold water will flow to sweep the thermostat sleeve. This corrugated spacer need extend only partway up the downcast pipe.

The second object of the invention is attained, by providing above the crosshead, a screw, screwing in an inverted **U**-bracket, extending upwards from a cross bar attached to the end of the thermostat sleeve and straddling the crosshead, which screw adjustably bears upon the midlength of a bar which is above the switch tappet crosshead and bears against its ends. The screw can thus be adjusted variably to distort, by minutely bending, the crosshead and thereby adjust its tappets relatively to the switches which they operate. By being screwed down sufficiently, the screw can bend the crosshead sufficiently to open both switches manually.

A representative example of an electric water heater constructed in accordance with the invention, and wherein for the sake of clearness the switches are shown simplified, is shown in the accompanying drawings, in which:—

Fig. 1 is a sectional front elevation of the electric water heater, and

Fig. 2 is a section on the line 2—2 of Fig. 1.

Fig. 3 is a diagram of the electric circuits of the electric resistance heater elements.

a is a wide and deep rectangular tank, preferably shallow front to back. This tank *a* is enclosed in an outer casing *b*, with an intervening air space *c* to provide heat-insulation.

Upstanding in and extending through the base of the tank *a* and base of the outer casing *b*, is a tubular spigot *d*, which is externally screw-threaded and receives a spacer nut *e* located between the bases of the tank *a* and outer casing *b*.

At its outwardly protruding extremity the tubular spigot *d* receives a union socket (not shown), clamping the base of the outer casing *b* against the spacer nut *e* and serving also for connection of the spigot *d* to a water supply main.

The tank *a* is covered at the top by a cover plate *f* having at the middle an aperture f^1. Over the aperture f^1 and with an interposed gasket *g* is a closure plate *h*. This plate *h* is clamped between nuts *i* and *j*, screwed on an externally screw-threaded gland *k*.

The brass sleeve *l* of a thermostat is soldered to and depends from the gland *k* to just above the upper end of the tubular spigot *d*. The nickel iron rod element *m* of the thermostat is soldered to, and closes, the lower end of the brass sleeve *l* thereof. This thermostat rod *m* extends up the sleeve *l* and protrudes through the gland *k* and through a guide sleeve *n*, retained by a union nut *o* thereon, and has a crosshead *p* secured to its upper end.

A downcast pipe *q* is secured over a reduced portion of, and is soldered to and depends from, the nut *j*. This downcast pipe *q* surrounds the thermostat sleeve *l* and depends to and surrounds the upper end of the tubular spigot *d*. Outlet slots q^1 are formed in the downcast pipe *q* near the lower end thereof.

r is an upper electric resistance heater

element and s is a lower electric resistance heater element, both helically surrounding the downcast pipe q respectively at different levels and depending from their ends which are secured to the closure plate h.

A corrugated sheet metal, preferably copper, annular spacer t, Fig. 2, is interposed between and in contact with the lower portion of the thermostat sleeve l and the lower portion of the downcast pipe q. Likewise another, outer, corrugated sheet metal, preferably copper, annular spacer u, Fig. 2, is interposed between the lower portion of the downcast pipe q and the upper and lower electric resistance elements r, s.

These corrugated spacers t, u provide, with the metal of the downcast pipe q, a metallic heat-conductive path between the heaters r, s and the thermostat sleeve l.

The inner corrugated spacer t also provides by the inwardly directed troughs of its corrugations, passages up which cold water admitted by the tubular spigot d sweeps and chills the thermostat sleeve l and issues at the top of the corrugated spacer into the downcast pipe q to flow down the outwardly directed troughs of the corrugated spacer t and issue from the slots q^1 of the downcast pipe q.

The corrugated spacers t, u also provide heating surfaces swept by the incoming water.

A vent hole q^2 is provided in the upper portion of the downcast pipe q to avoid a pocket of air being trapped therein.

r is an outlet pipe upstanding in the tank a and extending through the base of the outer casing b and secured by nuts w, x and an outer union socket (not shown).

The pipe r extends almost to the top of the tank a and at its upper end is covered by a domed cowl y, providing an anti-drip syphon leg.

The crosshead p of the thermostat rod m carries adjustable tappets p^1 and p^2 which, as the thermostat sleeve l expands, respectively successively open a switch r^1 in the circuit of the upper electric resistance heater element r and a switch s^1 in the circuit of the lower electric resistance heater element s, as diagrammatically shown in Fig. 3.

The top of the outer casing b is closed by a removable hood-like cover z.

The crosshead p carrying the switch tappets p^1, p^2 is straddled by an inverted U-shaped bracket 1 mounted on a cross bar 2 secured between a collar on the gland k and the nut i, and therefore to the top of the thermostat sleeve l. A milled headed screw 3 screws in the bracket 1 and by its point bears against the midlength of a bar 4, having downwardly directed ends bearing against the ends of the crosshead p. By screwing down the screw 3 the crosshead p can be variably distorted, by minutely bending and thereby the tappets p^1, p^2 can be manually adjusted relatively to the switches r^1, s^1. By being screwed down sufficiently, the screw 3 can even bend the crosshead sufficiently to open both switches manually.

Normally a volume of water, the upper level of which is determined by the position of the edge of the cowl y on the outlet pipe v, is contained in the tank a. This volume of water is maintained hot by the lower heater element s under the control of the thermostat l, m. To obtain hot water from the tank a, cold water is admitted by the tubular spigot d to displace hot water from the tank a. The cold water in flowing up the inner corrugated spacer t, sweeps and chills the thermostat sleeve l, which in contracting first closes the switch s^1 of the lower heater element s, if not already closed, and immediately thereafter, or if the switch s^1 is closed, immediately thereon closes the switch r^1 of the upper heater element r. The upper heater element r boosts the heating of the water in the tank a until the supply of cold water is interrupted, whereupon the thermostat sleeve l by its expansion successively first opens the switch r^1 of the upper heater element r and then the switch s^1 of the lower heater element s. When no hot water is drawn off from the tank a, the water therein is maintained hot by successive closing and opening by the thermostat l, m of the switch s^1 to energise and de-energise the lower heater element s. The upper heater element r becomes energised only whilst cold water is being admitted into the tank a, and whilst the temperature of the water in the tank a is low.

The electric resistance heater elements r, s are both energised and also cut out of circuit successively and never simultaneously, thus avoiding the heavy surges of current which would be imposed on the electric supply mains by simultaneous switching on and off of several elements by the thermostat.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is:—

1. A thermostatically controlled electric water heater as described in the specification of patent application No. 25953/45 (Serial No. 601,843) modified by the substitution for the riser pipe, of a tubular corrugated metal, preferably copper, spacer in metallic heat-conducting

continuity both with the other surface of the brass sleeve of the thermostat and also with the inner surface of the downcast pipe.

2. A thermostatically controlled water heater as claimed in claim 1, in which a screw is provided whereby the crosshead bearing the switch tappets can be distorted by bending to adjust or open the switches manually.

3. The improved thermostatically controlled electric water heater substantially as described with reference to the accompanying drawings.

Dated this 17th day of December, 1947.
PHILLIPS & LEIGH,
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31/33, High Holborn, London, W.C.1.
Agents for the Applicant.

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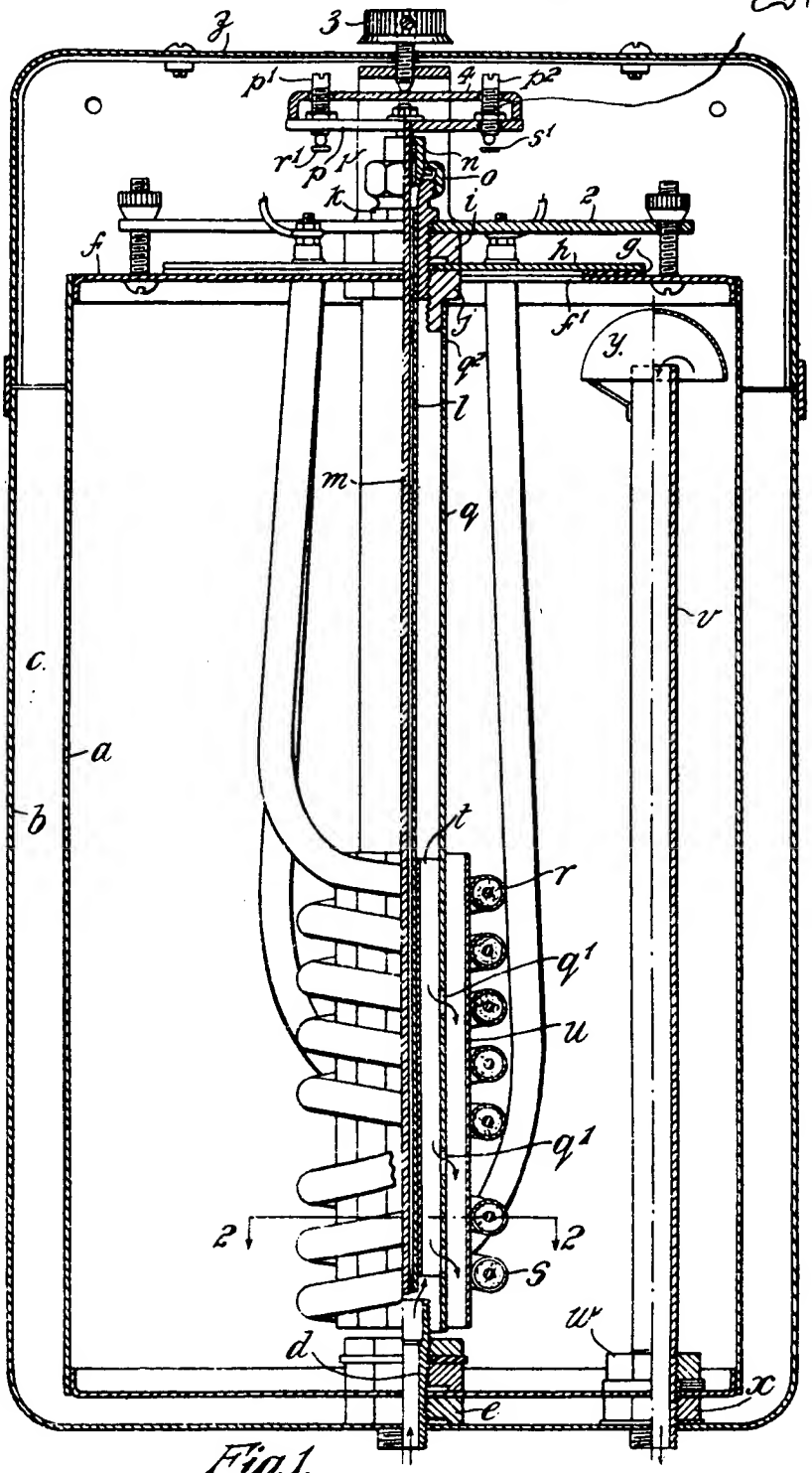


Fig. 1.

[This Drawing is a reproduction of the Original on a reduced scale.]

Fig.3.

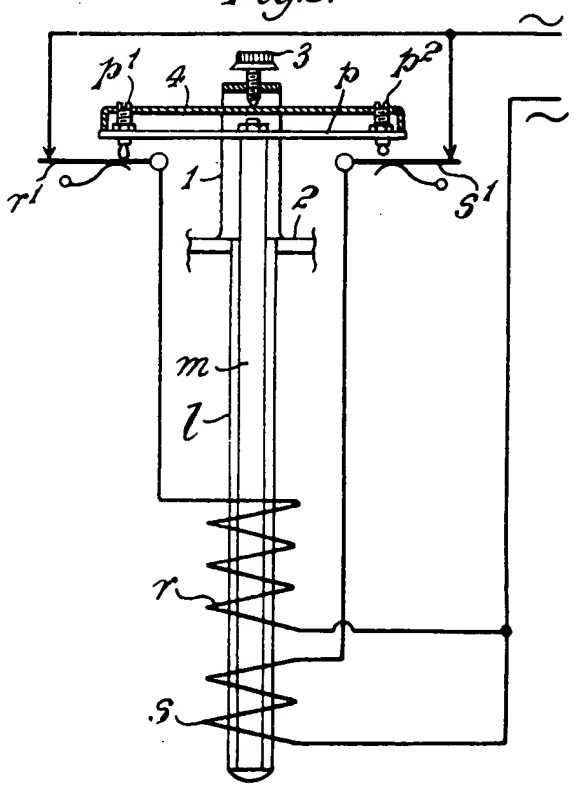
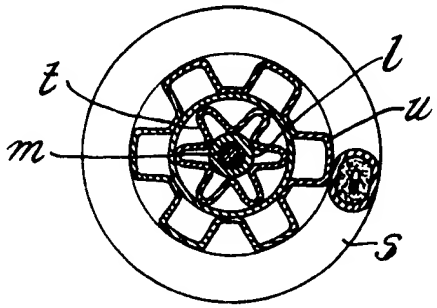


Fig.2.



H.M.S.O.(Ty.P.)